

***** RACER *****

*** NORMALIZING AND CONTACT RATE FACTORS ***

Reference	Age	Sex	Cond	Seas	Mean	SD/SE	Units	Minimum	Maximum	N	Location	Habitat	Notes
BODY WEIGHT (AND LENGTH)													
Brown & Parker 1984 (mormon)	0	M	J	SP	8.30		g (266mmSVL)				Utah 1969-72	desert shrub	Number in age column is age in years. Length measured from snout to vent (SVL). Snakes collected from dens.
	1	M	B	SP	27.0		g (420mmSVL)						
	2	M	B	SP	41.0		g (486mmSVL)						
	3	M	A	SP	49.1		g (520mmSVL)						
	4	M	A	SP	53.4		g (541mmSVL)						
	5	M	A	SP	60.4		g (564mmSVL)						
	6	M	A	SP	61.2		g (573mmSVL)						
Brown & Parker 1984 (mormon)	0	F	J	SP	8.8		g (272mmSVL)				Utah 1969-72	desert shrub	Number in age column is age in years. Length measured from snout to vent (SVL). Snakes collected from dens.
	1	F	B	SP	28.4		g (430mmSVL)						
	2	F	B	SP	51.6		g (524mmSVL)						
	3	F	B	SP	66.2		g (575mmSVL)						
	4	F	B	SP	71.4		g (599mmSVL)						
	5	F	B	SP	79.4		g (620mmSVL)						
	6	F	B	SP	84.0		g (632mmSVL)						
Brown & Parker 1984 (mormon)	A	F	1	SU	128.1	21.9 SD	g	103.1	156.6	4	Utah 1971-72	desert shrub	Weight of: (1)gravid females with eggs; (2)weight following laying of eggs; and (3)late summer weight - 31-53 days after laying. Length of snakes not provided.
	A	F	2	SU	73.7	12.5 SD	g	57.2	87.3	4			
	A	F	3	SU	114.7	32.5 SD	g	71.3	149.4	4			
Fitch 1982	A	B	-	-	126		g		538	1414	Kansas 1948-77	woodland, open field	
Gibbons & Semlitsch 1991	-	M	-	-	169.0		g (840mmSVL)				S Carolina	old fields, pine woods	
	-	F	-	-	150.0		g (830mmSVL)						
Fitch 1963 (flaviventris)	2	M	-	FA	68.2		g (615mmSVL)	51	92		Kansas 1949-62	woodland, grassland	Number in age column is age in years. Sampling occurred in both May and October. Length measured from snout to vent (SVL).
	2	M	-	SP	107.4		g (668mmSVL)	63	134				
	3	M	-	FA	102.1		g (706mmSVL)	65	129				
	3	M	-	SP	147.0		g (740mmSVL)	93	216				
	4	M	-	FA	139.0		g (757mmSVL)	95	251				
	4	M	-	SP	167.4		g (785mmSVL)	128	225				
	5	M	-	FA	152.4		g (806mmSVL)	110	198				
	5	M	-	SP	163.9		g (810mmSVL)	89	211				
	6	M	-	FA	175.9		g (827mmSVL)	130	230				
	7	M	-	FA	181.2		g (845mmSVL)	125	210				
	8	M	-	FA	217.5		g (868mmSVL)	194	225				

Reference	Age	Sex	Cond	Seas	Mean	SD/SE	Units	Minimum	Maximum	N	Location	Habitat	Notes
Fitch 1963 (flaviventris)	2	F	-	FA	83.5		g (644mmSVL)	52	127		Kansas 1949-62	woodland, grassland	Number in age column is age in years. Sampling occurred in both May and October. Length measured from snout to vent (SVL).
	2	F	-	SP	135.2		g (743mmSVL)	73	200				
	3	F	-	FA	149.4		g (810mmSVL)	98	219				
	3	F	-	SP	181.2		g (836mmSVL)	120	268				
	4	F	-	FA	212.3		g (866mmSVL)	175	243				
	4	F	-	SP	191.2		g (883mmSVL)	143	300				
	5	F	-	FA	209.6		g (914mmSVL)	136	275				
	5	F	-	SP	250.4		g (932mmSVL)	195	336				
	6	F	-	FA	245.9		g (965mmSVL)	218	283				
	6	F	-	SP	271.0		g (970mmSVL)	243	336				
	7	F	-	FA	251.3		g (974mmSVL)	150	330				
	7	F	-	SP	295.6		g (1000mmSVL)	235	375				
BODY LENGTH													
Corn & Bury 1986	A	M	-	-	632.4	66.74	SD mm SVL			10	e Colorado	foothills	Snout to vent length (SVL). Only adult snakes (>395mm SVL) used in analysis.
	A	F	-	-	739.5	77.29	SD mm SVL			10			
Corn & Bury 1986	A	M	-	-	640.6	76.23	SD mm SVL			11	w CO, ne VT	mountains	Snout to vent length (SVL). Only adult snakes (>395mm SVL) used in analysis.
	A	F	-	-	699.0	58.36	SD mm SVL			8			
Corn & Bury 1986	A	M	-	-	602.2	166.5	SD mm SVL			13	w Utah	foothills	Snout to vent length (SVL). Only adult snakes (>395mm SVL) used in analysis.
	A	F	-	-	682.5		mm SVL			2			
Fitch 1963 (flaviventris)	1	M	-	SP	539		mm SVL	432	609		Kansas 1949-62	woodland, grassland	Number in age column is age in years. Sampling occurred in both May and October. Length measured from snout to vent (SVL).
	2	M	-	FA	615		mm SVL	560	674				
	2	M	-	SP	668		mm SVL	620	710				
	3	M	-	FA	706		mm SVL	648	755				
	3	M	-	SP	740		mm SVL	667	780				
	4	M	-	FA	757		mm SVL	725	809				
	4	M	-	SP	785		mm SVL	720	850				
	5	M	-	FA	806		mm SVL	743	855				
	5	M	-	SP	810		mm SVL	773	858				
	6	M	-	FA	827		mm SVL	765	883				
	7	M	-	FA	845		mm SVL	788	900				
	8	M	-	FA	868		mm SVL	740	890				
	8	M	-	SP	870		mm SVL						
Fitch 1963 (flaviventris)	1	F	-	SP	581		mm SVL	415	658		Kansas 1949-62	woodland, grassland	Number in age column is age in years. Sampling occurred in both May and October. Length measured from snout to vent (SVL).
	2	F	-	FA	644		mm SVL	580	738				
	2	F	-	SP	743		mm SVL	670	826				
	3	F	-	FA	810		mm SVL	730	880				
	3	F	-	SP	836		mm SVL	736	915				
	4	F	-	FA	866		mm SVL	791	920				
(continued)	4	F	-	SP	883		mm SVL	810	952				

Reference	Age	Sex	Cond	Seas	Mean	SD/SE	Units	Minimum	Maximum	N	Location	Habitat	Notes
Fitch 1963 (continued)	5	F	-	FA	914		mm SVL	833	1,088				
	5	F	-	SP	932		mm SVL	883	990				
	6	F	-	FA	965		mm SVL	892	1,020				
	6	F	-	SP	970		mm SVL	885	1,003				
	7	F	-	FA	974		mm SVL	919	1,050				
	7	F	-	SP	1,000		mm SVL	930	1,085				
Martoff et al. 1980	A	-	-	-			mm	914	1,676		NS	NS	Total length or snout-to-vent length (SVL) not specified.
Vermersch & Kuntz 1986 (flaviventris)	A	-	-	-			mm total	762	1,370		Texas	NS	
Wright & Wright 1957 (constrictor)	A	M	-	-			mm total	680	1,595		NS	NS	As cited in DeGraaf and Rudis 1983.
	A	F	-	-			mm total	710	1,683				
EGG WEIGHT													
Brown & Parker 1984 (mormon)	-	-	-	-	7.80	0.17 SE	g	5.9	10.8	54	Utah 1970-71	desert shrub	
Fitch 1963 (flaviventris)	-	-	1	-	5.5		g	4.4	6.0	17	Kansas 1949-62	woodland, grassland	Clutches from six females of SVL
	-	-	2	-	4.9		g	4.4	5.2	12			(1) 892 mm; (2) 773 mm; (3) 772 mm;
	-	-	3	-	5.2		g	4.4	6.2	14			(4) 807 mm; (5) 858 mm; and (6) 899
	-	-	4	-	6.0		g	5.6	6.5	10			mm. Sample size = clutch size.
	-	-	5	-	5.4		g	5.0	5.8	11			
	-	-	6	-	6.0		g	5.6	6.7	8			
Fitch 1963 (flaviventris)	-	-	1	-	5.9		g	5.6	6.3	21	Kansas 1949-62	woodland, grassland	Clutches of five females of SVL (1)
	-	-	2	-	6.8		g	6.1	7.5	13			1053 mm; (2) 907 mm; (3) 911 mm;
	-	-	3	-	4.9		g	4.3	5.5	18			(4) 843 mm; and (5) 846 mm. Sample
	-	-	4	-	5.2		g	3.8	6.1	12			size = clutch size.
	-	-	5	-	6.8		g	6.2	7.6	14			
HATCHING WEIGHT (AND LENGTH)													
Brown & Parker 1984 (mormon)	H	B	-	-	6.0		g			26	Utah 1969-72	desert shrub	
	H	B	-	-	(230)		(mm SVL)			26			
Fitch 1963 (flaviventris)	H	B	-	-	4.16		g	2.4	5.8		Kansas	lab	Size and weight at hatching.
	H	B	-	-	(214.5)		(mm SVL)	186	244				

Reference	Age	Sex	Cond	Seas	Mean	SD/SE	Units	Minimum	Maximum	N	Location	Habitat	Notes
HATCHING LENGTH													
Martof et al. 1980	H	-	-	-	290		mm				NS	NS	Total length or snout-to-vent length (SVL) not specified.
Vermersch & Kuntz 1986 (flaviventris)	H	-	-	-			mm total	305			Texas	NS	
GROWTH RATE													
Fitch 1963 (flaviventris)	J	B	-	SU	0.116		g/day			25	Kansas 1953-59	woodland, grassland	Growth during the ten week period from hatching to hibernation.
METABOLIC RATE (OXYGEN)													
Ruben 1976	A	-	ST	-	2.4		102/kg-day			6	NS 1974	lab	Standard (ST) metabolic rate at body temperature of 35 C. Number in condition column is (1)metabolic rate of active (electrically stimulated) snakes at 35 C body temperature. Mean weight of snakes was 262g; includes data from a masticophis sp. which was found to show similar results.
	A	-	1	-	24.5		102/kg-day			6			
FOOD INGESTION RATE													
Fitch 1982 (flaviventris)	B	B	-	-	0.02		g/g-day				Kansas 1948-77	woodlands, grassy areas	Rough estimate of food consumed from spring through fall based on author's calculation that these snakes eat approximately four times their body weight over the 213 day active season. Of the 12 snake species in the study area, C. constrictor thought to eat the most relative to its body weight.
BODY TEMPERATURE													
Brown 1973 (mormon)	A	B	-	SU	31.8	0.20 SE	degrees C	18.6	37.7	266	n Utah	desert shrub	Body temperature of active snakes under natural conditions; elevation 1,580 meters. As cited in Brown and Parker 1982.

Reference	Age	Sex	Cond	Seas	Mean	SD/SE	Units	Minimum	Maximum	N	Location	Habitat	Notes
Brown & Parker 1982 (mormon)	A	B	-	SU	27.5	0.4	SE degrees C	17.5	35.2	127	n Utah 1969-73	cold desert shrub	Snakes located underground (inactive) under natural conditions; elevation 1,580 meters.
Fitch 1963 (flaviventris)	A	B	-	SU			degrees C	15.5	32.4	60	Kansas 1962	grassland, woodlands	Active snakes captured by hand. The greatest densities of snakes were found when ambient temperatures were between 26-27 C.
Hammerson 1987	A	B	-	SU	32.15	0.16	SE degrees C			130	w c California	"natural" enclosure	Body temperature of active snakes under natural weather conditions. Elevation 180 meters.
Hammerson 1987	A	B	-	SU	32.7	0.29	SE degrees C			91	Kansas	outdoor enclosure	Active racers under natural conditions; elevation 300 meters; based on cloacal temperatures of snakes in outdoor enclosures. Mean and SE calculated by Hammerson 1987 from data published in Fitch 1963 (figure 5).
Hammerson 1987	-	-	1	SU	21.6	2.6	SD degrees C	17.1	26.4	9	w c California	"natural" enclosure	Body temperature at (1)initial morning emergence; (2)end of morning basking; (3)end of daily activity. Measured during June and July.
	-	-	2	SU	33.8	1.0	SD degrees C	33.4	35.0	7			
	-	-	3	SU	30.0	3.2	SD degrees C	26.4	35.7	8			
Hammerson 1987	A	B	-	SU	32.7	0.29	SE degrees C			91	Kansas	outdoor enclosure	Active racers under natural conditions; elevation 300 meters. Mean based on cloacal temperatures of snakes. Calculated from Fitch's (1963) Figure 5.

*** DIET ***

Reference	Age	Sex	Food type	Spring	Summer	Fall	Winter	N	Location	Habitat - Measure	Notes
Brown & Parker 1982 (mormon)	B	B	insects (mostly orthopterans)			96		102	Utah 1969-72	desert shrub -	Snakes collected from May-October but most records were from
			mammals (Peromyscus)			3				% frequency of occurrence; stomach contents	September when snakes were returning to hibernacula.
			snakes (Masticophis taeniatus)			1					
Fitch 1963 (flaviventris)	B	B	small mammals		65.7			1351	Kansas 1949-62	grassland, woods -	From a variety of locations in Kansas. Stomach contents were squeezed out of live snakes.
			orthopterans		14.3					% wet weight; scats and stomach contents	
			lizards		9.2						
			snakes		4.2						
			misc. insects		1.9						
			birds		3.5						
			frogs		1.2						

Reference	Age	Sex	Food type	Spring	Summer	Fall	Winter	N	Location	Habitat - Measure	Notes
Fitch 1963 (flaviventris)	B	B	mice orthopterans lizards frogs snakes crickets		15.4 4.6 61.5 12.6 5.1 0.8			69	Kansas 1949-62	grassland, woods - % wet weight; stomach contents	From Harvey County Park. Stomach contents were squeezed out of live snakes.
Fitch 1982 (flaviventris)	B	B	Acheta assimilis other insects prairie vole other small mammals other vertebrates		15 62 8 7 8			986	Kansas 1948-77	woodland, open field - % occurrence; in stomach, scat, or observed eating	All sizes of snakes.
Klimstra 1959	B	B	insects small mammals amphibians reptiles birds other (sample size)	20 62 5 7 4 2 (58)	40 27 13 8 6 6 (52)	64 21 3 - 8 4 (11)			s Illinois 1950-57	pastures, meadows - % volume; digestive tracts	Size of snakes not specified; captured within the range of C. c. flaviventris and C. c. priapus. Values are averages of monthly data (March-October). Small mammal prey consisted primarily of meadow voles and Peromyscus spp; insects were primarily crickets and locusts; amphibians were primarily Ranid frogs.
Uhler et al. 1939 (constrictor)	-	-	reptiles small mammals birds insects amphibians		31.9 26.0 17.8 15.0 9.4			16	NS	NS - % volume; stomach contents	Season and size of snakes not specified. As cited in Klimstra 1959.

*** POPULATION DYNAMICS ***

Reference	Age	Sex	Cond	Seas	Mean	SD/SE	Units	Minimum	Maximum	N	Location	Habitat	Notes
HOME RANGE SIZE													
Fitch 1963 (flaviventris)	A	M	-	SU	11.7		ha			244	Kansas 1949-62	woodland, grassland	Based on average home range radius estimated from movement data (not including the shortest 10% of movements or longest 10% of movements).
	A	F	-	SU	9.6		ha			132			
Fitch 1963 (flaviventris)	A	M	-	SU	3.0		ha			15	Kansas 1949-62	woodland, grassland	Minimum home ranges from plots of recapture data. Range for both sexes combined was 1.3-5.2 ha.
	A	F	-	SU	1.8		ha			5			
Vermersch & Kuntz 1986 (flaviventris)	-	-	-	-	10.1		ha				Texas	NS	Source and methods of data not specified.

Reference	Age	Sex	Cond	Seas	Mean	SD/SE	Units	Minimum	Maximum	N	Location	Habitat	Notes
POPULATION DENSITY													
Brown & Parker 1984 (mormon)	B	B	1	-	0.79		N/ha			528	Utah 1971	desert shrub	Density of snakes at least one year old in: (1) area M; and (2) area S. Density estimated from mark-recapture using the Jolly-Seber method.
	B	B	2	-	0.32		N/ha			271			
Fitch 1963 (flaviventris)	A	B	-	SU	4.7		N/ha			75	Kansas 1955-61	bottomland pastures, old fields	Number of adults present at annual population low (early summer). N = estimated population size. Amount of first year young present thought to be equal to number of adults; young of year have not hatched yet.
Fitch 1963 (flaviventris)	A	B	-	SU	2.7		N/ha			153	Kansas 1958-62	prairie grasses, hilltop	Number of adults present at annual population low (early summer). N = estimated population size. Amount of first year young present thought to be equal to number of adults; young of year have not hatched yet.
Fitch 1963 (flaviventris)	A	B	-	SU	7.0		N/ha			135	Kansas 1958-62	upland prairie, weeds, grasses	Number of adults present at annual population low (early summer). N = estimated population size. Amount of first year young present thought to be equal to number of adults; young of year have not hatched yet.
Turner 1977 (flaviventris)	-	-	-	-	5.0		N/ha				Kansas	NS	As cited in Brown and Parker 1984.
CLUTCH SIZE													
Behler & King 1979	-	-	-	-			eggs	5	28		NS		
Brown & Parker 1984 (mormon)	-	-	-	-	5.28	0.24 SE	eggs	4	8	43	Utah	desert shrub	Clutch size increases with increasing female body size. Clutch size = $-0.56 + .10 \text{ SVL (cm)}$.
Corn & Bury 1986	-	-	-	-	7.4		eggs	4	10	5	w Utah	foothills	
Corn & Bury 1986	-	-	-	-	12		eggs	9	14	6	e Colorado	foothills	

Reference	Age	Sex	Cond	Seas	Mean	SD/SE	Units	Minimum	Maximum	N	Location	Habitat	Notes
Fitch 1963 (flaviventris)	-	F	2	SU	9.2		eggs	6	12	10	Kansas 1949-62	woodland, grassland	Age and snout-to-vent length (SVL) of females (mm): (2)2 yrs - 688mm (589-748); (3)3 yrs - 789mm (756-840); (4)4 yrs - 856mm (850-861); (5)5 yrs - 907mm (392-933); and (6)6+ yrs - 1005mm (955-1088).
	-	F	3	SU	9.9		eggs	5	14	19			
	-	F	4	SU	10.8		eggs	8	12	7			
	-	F	5	SU	13.0		eggs	8	17	6			
	-	F	6	SU	15.7		eggs	11	19	10			
Fitch 1963 (constrictor)	-	-	-	-	16.8		eggs	7	31	14	NS	NS	From own data and unspecified other studies.
Fitch 1963 (priapus)	-	-	-	-	12.6		eggs	7	21	11	NS	NS	From own data and unspecified other studies.
Fitch 1963 (mormon)	-	-	-	-	5.79		eggs	2	13	43	NS	NS	From own data and unspecified other studies.
Martof et al. 1980	-	-	-	-			eggs	4	25		Virginia, Carolinas	NS	
Pope 1944 (flaviventris)	-	-	-	-			eggs	19	25		Illinois	NS	As cited in Smith 1961.
Smith 1956	-	-	-	-			eggs	8	25		Kansas	NS	
Vermersch & Kuntz 1986 (flaviventris)	-	-	-	-			eggs	3	23		Texas	NS	
CLUTCHES/YEAR													
Fitch 1963 (flaviventris)	-	-	-	-	0.5		/yr	0	1		Kansas 1949-62	woodland, grassland	Only about 50% of adult females produce offspring each year, suggesting that an individual female might reproduce only in alternate years.
DAYS INCUBATION													
Behler & King 1979	-	-	-	-	42-63		days				NS		
Brown & Parker 1984 (mormon)	-	-	1	SU	42.6		days	41	44	3	Utah 1971-72	lab, desert	(1) Lab 1971; (2) lab 1972; (3) field. Lab temperature was 29 C.
	-	-	2	SU	44-45		days			3			
	-	-	3	SU	45-50		days			2			
Fitch 1963 (flaviventris)	-	-	-	SU	51		days	43	63	12	Kansas 1949-62	lab	Temperature range not specified.

Reference	Age	Sex	Cond	Seas	Mean	SD/SE	Units	Minimum	Maximum	N	Location	Habitat	Notes
Smith 1956 (constrictor)	-	-	-	-	65		days	61	70		NS	NS	
AGE AT SEXUAL MATURITY													
Behler & King 1979	-	-	-	-	2-3		years				NS	NS	
Brown & Parker 1984 (mormon)	-	F	-	-	3		years	2	6	400	Utah 1969-72	desert shrub	
	-	M	-	-	13.5		months			174			
Fitch 1963 (flaviventris)	-	F	-	-	2-3		years				Kansas 1949-62	woodland, grassland	Males produce sperm at a little over a year, but do not breed until the following spring at about 20 months of age.
	-	M	-	-	13-14		months						
MORTALITY													
Brown & Parker 1984 (mormon)	A	M	-	-	29		%/yr	19	38	3 yrs	Utah 1970-72	desert shrub	Adults defined as snakes one year old or older; juveniles were young of the year.
	A	F	-	-	30		%/yr	21	45	3 yrs			
	J	B	-	-	76		%/yr	73	77	3 yrs			
Brown & Parker 1984 (mormon)	-	B	-	SU	8		%egg-hatch	45	days		Utah 1969-72	desert shrub	Percent mortality for various life-stage intervals (juv = juvenile, yrng = yearling). Days listed in the maximum column indicate the duration of the period over which the mortality estimate was made.
	J	B	-	FA	21		%hatch-juv	45	days				
	J	B	-	FA	77		%juv-yrng	345	days				
	J	B	-	-	83		%egg-yrng	450	days				
Brown & Parker 1982 (mormon)	A	B	-	-	21		%/yr				Utah 1969-73	cold desert shrub	
	J	B	-	-	83		%/1st yr						
Fitch 1963 (flaviventris)	2	B	-	FA	58		%/yr				Kansas 1949-62	woodland, grassland	Number is age in years. Age-specific annual mortality with age measured in years.
	3	B	-	FA	30		%/yr						
	4	B	-	FA	25		%/yr						
	5	B	-	FA	35		%/yr						
	6	B	-	FA	30		%/yr						
	7	B	-	FA	38		%/yr						
LONGEVITY													
Brown & Parker 1982 (mormon)	A	B	-	-			years		20		Utah 1969-73	cold desert shrub	

*** SEASONAL ACTIVITIES ***

Reference	Begin	Peak	End	Location	Habitat	Notes
MATING						
DeGraaf & Rudis 1983 (constrictor)	May		earl Jun	NS	NS	
Fitch 1963 (flaviventris)	Apr	May	Jun	Kansas 1949-62	woodland, grassland	
Vermersch & Kuntz 1986 (flaviventris)	Apr		May	Texas	NS	
EGG-LAYING						
Brown & Parker 1984 (mormon)	Jun	Jul		Utah 1969-73	desert shrub	
DeGraaf & Rudis 1983 (constrictor)	Jun		earl Jul	NS	NS	
Fitch 1963 (flaviventris)	Jun 13		Jul 16	Kansas 1949-62	woodland, grassland	
Martof et al. 1980	Jun		Jul	Virginia, Carolinas	NS	
Smith 1956	Jun		Jul	Kansas	NS	
Vermersch & Kuntz 1986 (flaviventris)	Jun		earl Aug	Texas	NS	
HATCHING						
Brown & Parker 1984 (mormon)		mid-late Aug		Utah 1969-73	desert shrub	
DeGraaf & Rudis 1983 (constrictor)	late Aug		Sept	NS	NS	
Fitch 1963 (flaviventris)	late Aug		earl Sep	Kansas 1949-62	woodland, grassland	

Reference	Begin	Peak	End	Location	Habitat	Notes
Smith 1956	Aug		Sept	Kansas	NS	Based on laying season and incubation period.
Vermersch 1986 (flaviventris)	Aug		Sept	Texas	NS	
HIBERNATION						
Brown & Parker 1982 (mormon)	earl Oct		earl May	Utah 1969-73	cold desert shrub	
Fitch 1963 (flaviventris)	late Nov		earl Apr	Kansas 1949-62	woodland, grassland	Earliest and latest time active racers were found.

***** NORTHERN WATER SNAKE *****

*** NORMALIZING AND CONTACT RATE FACTORS ***

Reference	Age	Sex	Cond	Seas	Mean	SD/SE	Units	Minimum	Maximum	N	Location	Habitat	Notes
BODY WEIGHT (AND LENGTH)													
Alexander 1977	A	B	-	-	220.0		g			38	s lower Michigan	stream, lake	Length of snakes not specified.
Brown 1958 (sipedon)	J	B	1	SU	7.0	2.3 SD	g (285 mm)	5.3	10.4	4	New York 1938	captive	Snakes nearing the end of their (1) first; (2) second; (3) third; and (4) fifth or sixth year of life. Length is total length.
	J	B	2	SU	29.0		g (496 mm)	25.2	32.7	2			
	J	M	3	SU	53.2		g (607 mm)			1			
	A	B	4	SU	210.0	65.0 SD	g (868 mm)	114.0	255.0	4			
Fitch 1982	A	B	-	-	207.0		g		480	206	Kansas 1948-77	ponds, streams	Length of snakes not specified.
BODY LENGTH													
Beatson 1976 (sipedon)	J	B	1	-			mm SVL	180	340		Kansas 1972	stream	Length measured from snout to vent (SVL). Age of snakes: (1) one year; (2) two or more years.
	B	M	2	-			mm SVL	340	660				
	B	F	2	-			mm SVL	340	840				
Behler & King 1979	N	B	-	-			mm SVL	165	300		NS	NS	Newborn snakes. Length measured from snout to vent (SVL).
Behler & King 1979	A	B	-	-			mm SVL	559	1346		NS	NS	Length measured from snout to vent (SVL).
King 1989 (insularum)	A	M	-	-	620		mm SVL			398	Ohio, Ontario CAN 1980-85	shore, islands of Lake Erie	Weighted average. Length measured from snout to vent (SVL).
	A	F	-	-	745		mm SVL			313			
King 1986 (insularum)	J	B	1	SP			mm SVL	155	225		Ohio, Ontario CAN 1980-84	Lake Erie islands	(1) Young of the year; (2) snakes from 1-3 years old. Length measured from snout to vent (SVL).
	J	B	1	FA			mm SVL	270	340				
	J	M	2	-			mm SVL	270	430				
	J	F	2	-			mm SVL	270	590				
King 1986 (insularum)	A	M	BR	SP	625		mm SVL	520	730	27	Ohio, Ontario CAN 1980-84	Lake Erie islands	Snakes captured while courting. Length measured from snout to vent (SVL). Adults defined as male snakes >430 mm SVL and females >590 mm SVL (greater than 3 years old).
	A	F	BR	SP	821		mm SVL	660	1,000	18			

Reference	Age	Sex	Cond	Seas	Mean	SD/SE	Units	Minimum	Maximum	N	Location	Habitat	Notes
Raney & Roecker 1947 (sipedon)	J	B	0	-	200-250		mm total				New York 1942, 1946	creeks	Measure reflects total length of snakes. Juveniles in their (0) first fall and spring; (1) second fall and spring. Collected from May-Sept. Maximum values are the largest snakes found in a collection of 59.
	J	B	1	-	360-400		mm total						
	A	F	-	-			mm total		980	59			
	A	M	-	-			mm total		780	59			
Wright & Wright 1957	A	M	-	-			mm total	635	1,148		NS	NS	Measure reflects total length of snakes. As cited in DeGraaf and Rudis 1983.
	A	F	-	-			mm total	650	1,295				
NEONATE WEIGHT													
Feaver 1977 (sipedon)	N	B	-	-	5		g			NS	Michigan	pond, marshes	Length measured from snout to vent (SVL). As cited in King 1986.
	N	B	-	-	(188)		(mm SVL)			NS			
Fitch 1982	N	B	-	-	5.0		g	3.6	6.8	57	Kansas 1948-77	ponds, streams	Length of snakes not specified.
King 1986 (insularum)	N	B	-	-	4.8		g	3.6	6.6	893	Ohio, Ontario CAN 1980-84	Lake Erie islands	Length measured from snout to vent (SVL).
	N	B	-	-	(181)		(mm SVL)	125	210	893			
Martof et al. 1980	N	B	-	-	200		mm SVL				NS	NS	Length measured from snout to vent (SVL) of young.
NEONATE LENGTH													
Beatson 1976 (sipedon)	N	B	-	-			mm SVL	135	220	263	Kansas 1972	stream	Length measured from snout to vent (SVL).
GROWTH RATE													
Brown 1958 (sipedon)	J	B	1	SU	1.0	0.43	SD mm/day	0.46	1.5	4	New York 1938	captive	Daily growth rate during the summer (July-Aug). Mean temperature was 28 C. Snakes nearing the end of their (1) first; (2) second; (3) third; and (4) fourth year of life. Converted from weekly growth rate.
	J	B	2	SU	0.77		mm/day	0.77	0.78	2			
	J	M	3	SU	0.42		mm/day			1			
	A	B	4	SU	1.0	0.31	SD mm/day	0.71	1.4	4			
Brown 1958 (sipedon)	J	B	1	SU	0.18	0.08	SD g/day	0.13	0.27	4	New York 1938	captive	Daily growth rate during the summer (July-Aug). Mean temperature was 23 C. Snakes nearing the end of their (1) first; (2) second; (3) third; and (4) fifth or sixth year of life. Converted from weekly growth rates.
	J	B	2	SU	0.42		g/day	0.40	0.45	2			
	J	M	3	SU	0.80		g/day			1			
	A	B	4	SU	2.59	0.58	SD g/day	1.74	3.02	4			

Reference	Age	Sex	Cond	Seas	Mean	SD/SE	Units	Minimum	Maximum	N	Location	Habitat	Notes
King 1986	B	F	1	-	0.12		mm SVL/day			56	Ohio 1980-84	Lake Erie islands	Annual growth rate for: (1) juveniles (1-3 years old) and adults; (2) young-of-the year. Length measured from snout to vent (SVL). Measured from May-Sept (most growth occurs during this period) and then adjusted to represent an annual rate. Highest growth rate for young-of-the year occurred from late July to mid August.
	B	M	1	-	0.14		mm SVL/day			42			
	Y	B	2	-	0.33		mm SVL/day			364			
METABOLIC RATE (OXYGEN)													
Gratz & Hutchinson 1977 (Nerodia rhombifera, a similar species)	B	B	1	-	0.607	0.0348 SE	l02/kg-day	0.389	0.938	219	Oklahoma	lab	24 hour mean resting metabolism in Nerodia rhombifera (weights from 60g-1,400g). Snakes acclimated at a 12:12 light:dark photoperiod and at a temperature of (1) 15 C; (2) 25 C; (3) 35 C. Snakes exhibited significant daily cycles at 15 C and 35 C. Time of day (CDT) for min and max (respectively) were: (1) 2200-2400 and 1200; (2) 0100-0200 and 0800; and (3) 1100-1200 and 0700. N = number of animal hours used to determine mean value.
	B	B	2	-	3.29	0.101 SE	l02/kg-day	2.81	4.44	240			
	B	B	3	-	7.33	0.226 SE	l02/kg-day	5.70	9.99	235			
FOOD INGESTION RATE													
Brown 1958 (sipedon)	J	B	1	SU	0.088		g/g-day			4	New York 1938	captive	Mean temperature during study was 23 C. Snakes nearing the end of their (1) first; (2) second; (3) third; and (4) fifth or sixth year of life. Mean weight and length of the study groups are presented under "body weight". Snakes were all fed fish, except one of the adults was fed only frogs. Converted from % of body weight eaten per week; snakes did not eat every day.
	J	B	2	SU	0.043		g/g-day			2			
	J	M	3	SU	0.043		g/g-day			1			
	A	B	4	SU	0.061		g/g-day			4			
Brown 1958 (sipedon)	B	B	-	-	0.26	0.10 SD	g/g-day	0.11	0.43	19	New York 1938	captive	"Maximum" meals for empty snakes; snakes were fed fish and/or frogs until they refused to take more food. After a "maximum" meal the snakes generally refused food for the next 3-5 days. Temperature during study not specified.

Reference	Age	Sex	Cond	Seas	Mean	SD/SE	Units	Minimum	Maximum	N	Location	Habitat	Notes
SURFACE AREA													
Baeyens & Rountree 1983 (Nerodia rhombifera, a similar species)	-	-	-	-	131.16 (155)		cm2 (mm SVL)			15	Arkansas 1981	pond	Length measured from snout to vent (SVL). This species (N. rhombifera) is not N. sipedon, but is a similar species.

BODY TEMPERATURE

Justy & Mallory 1985 (sipedon)	A	-	1	-	30.4	0.4 SE	degrees C			3	Ontario, CAN	lab	Mean internal temperature selected by snake when exposed to thermal gradient from 12-45 C in a: (1) lighted cage-morning; (2) lighted cage-afternoon; (3) dark cage-morning; and (4) dark cage-afternoon.
	A	-	2	-	34.0	0.2 SE	degrees C			3	1980		
	A	-	3	-	32.0	0.4 SE	degrees C			3			

*** DIET ***

Reference	Age	Sex	Food type	Spring	Summer	Fall	Winter	N	Location	Habitat - Measure	Notes
Alexander 1977	B	B	trout		64			28	n lower Michigan	streams	Collected whenever they were found; thought to be active in area from May-Sept.
			non-trout fish		7					-	
			unidentified fish		1					% wet weight;	
			crustaceans		1					stomach contents	
			amphibians		14						
			birds and mammals		12						
			unidentified		1						
Alexander 1977	B	B	trout		4			9	n lower Michigan	lake	Collected whenever they were found; thought to be active in area from May-Sept.
			non-trout fish		8					-	
			crustaceans		15					% wet weight;	
			birds and mammals		2					stomach contents	
			amphibians		68						
			unidentified		3						
Barbour 1950 (sipedon)	-	-	unidentified fish		50.0			8	se KY 1939,1948	fork of a river	Collected in June, July. Presumed that the unidentified detritus was from the intestines of the fish. A specimen from a small woodland stream at 2450 ft. elevation contained the remains of two large Desmosnathus fuscus.
			Rana sp. tadpoles		12.5					-	
			Cambarus sp.		12.5					% volume; stomach	
			unidentified detritus		25.0					contents	

Reference	Age	Sex	Food type	Spring	Summer	Fall	Winter	N	Location	Habitat - Measure	Notes
Brown 1958 (sipedon)	B	B	minnows		7.7			120	c New York 1933-38	rocky streams - % volume; stomach contents	Months of collection and size of snakes not specified.
			darters		3.1						
			suckers (Catostomus)		35.4						
			sculpin (Cottus)		1.4						
			catfish		9.3						
			lamprey		23.0						
			game fishes		1.2						
			unidentified fish		1.6						
			amphibians		17.3						
Brown 1958 (sipedon)	B	B	minnows			9.1		48	n lower MI 1933-38	lakes - % volume; stomach contents	Months of collection and size of snakes not specified.
			darters			1.4					
			amphibians			52.8					
			sculpin (Cottus)			2.2					
			trout perch (Percops)			2.8					
			game fishes (Perca)			14.1					
			burbot (Lota)			17.4					
			catfish			0.3					
Brown 1958 (sipedon)	J	B	minnows		26.0			73	NY,MI 1933-38	streams, lakes, bog - % volume; stomach contents	Snakes estimated to be in their first year of life (207-380 mm total length). Months of capture not specified.
			darters		27.0						
			amphibians		18.0						
			sculpin (Cottus)		10.0						
			suckers (Catostomus)		7.0						
			catfish		1.7						
			troutperch (Percopsi)		5.6						
			game fish (Micropter)		5.0						
			unidentified fish		0.3						
Bush 1959 (sipedon)	-	-	Cyprinidae		42.8			7	Kentucky 1955-56	fork of river - % wet volume; stomach contents	
			Centrarchidae		28.5						
			Rana c.melanota		14.3						
			Eurycea b. rivicola		14.3						
Camp et al. 1980 (pleuralis)	-	-	Esocidae		7.0			14	Georgia 1977-79	aquatic (NS) - % wet volume; stomach contents	Percent volume measured by water displacement. Age, sex, size class, and season not specified.
			Catostomidae		22.5						
			Percidae		15.7						
			Proteidae		51.9						
			Cyprinidae		1.5						
			Centrarchidae		0.3						
Lagler & Salyer 1945 (sipedon)	B	B	trout		19.0			106	lower Michigan 1944	trout streams - % volume; stomach contents	Mean length for entire study (N=287) = 620 mm total length. Most fish were between 3.8-12.5 cm in length. Number and size of prey (but not % volume) are listed in the reference.
			lampreys		3.3						
			forage fishes		55.8						
			fish remains		0.2						
			burbot		7.3						
			frogs		12.8						
			misc. invertebrates		1.6						

Reference	Age	Sex	Food type	Spring	Summer	Fall	Winter	N	Location	Habitat - Measure	Notes
Lagler & Salyer 1945 (sipedon)	B	B	game and pan fishes forage fishes other fishes fish remains frogs and salamander rodents		19.3 23.4 2.9 1.8 52.6 TR			18	lower Michigan 1944	inland lakes - % volume; stomach contents	Mean length for entire study (N=287) = 620 mm total length. Collected from May-Sept.; mostly in July-August. Most fish were between 2.5-10.0 cm in length. Number and size of prey found (but not % volume) are listed in the reference. TR = trace.
Lagler & Salyer 1945 (sipedon)	B	B	trout bass or sunfish forage fishes other fishes fish remains Amphibia Insecta misc. invertebrates		48.9 TR 44.0 3.8 1.4 1.1 0.5 0.3			64	lower Michigan 1944	trout-rearing stations - % volume; stomach contents	Mean length for entire study (N=287) = 620 mm total length (range 210-970 mm total length). Collected from May-Sept.; mostly during July & August. Mean size of trout = 4.8 cm (range 21.6-2.5 cm); greatest number eaten by one snake was 26; mean for all snakes collected was 2.5. Reference lists the number of each species caught but does not give volume estimates based on the species breakdown. TR = trace.
Raney & Roecker 1947 (sipedon)	B	B	suckers minnows catfish mudminnows darters fish remains Rana sp. tadpoles		39.9 29.0 3.7 2.7 5.3 15.2 4.2			59	w New York 1942, 1946	creeks - % volume; stomach contents	All size classes; 20-98 cm total length. Most eating fish had only one specimen in their stomach.
Uhler et al. 1939 (sipedon)	-	-	fish frogs & toads salamanders insects other		61 21 12 2.5 3.5			30	Virginia	habitat NS - % by volume	Season, age, and sex not specified. As cited in Raney and Roecker 1947.

*** POPULATION DYNAMICS ***

Reference	Age	Sex	Cond	Seas	Mean	SD/SE	Units	Minimum	Maximum	N	Location	Habitat	Notes
POPULATION DENSITY													
Beatson 1976 (sipedon)	B	B	-	SU	34-41		N/km			197	Kansas 1972	stream	Density per km of stream. 197 snakes captured; estimated to be 75 to 90% of the population. Measured prior to the birth of young of the year.

Reference	Age	Sex	Cond	Seas	Mean	SD/SE	Units	Minimum	Maximum	N	Location	Habitat	Notes
Fitch 1982	B	B	-	-	0.131		N/ha				Kansas 1957-61	forest, streams, shrubs, prairies	Count excludes young of the year. Rough estimate based on comparison with more commonly found associated species censused by capture-recapture ratios.
King 1986 (insularum)	A	B	-	-	138		N/km	22	381	5	Ohio, Ontario CAN 1980-84	Lake Erie islands	Density per km of shoreline of snakes from five islands.
Lagler & Salyer 1945 (sipedon)	B	B	-	SU	160		N/km				lower Michigan 1944	streams	Estimate of number of snakes per km of stream based on observations of 32 snakes and authors assumption that this is only a fraction of the total population.
LITTER SIZE (young born live)													
Aldridge 1982	-	-	1	-	17	5 SD		9	42	15	e c Missouri	streams	Size of females:(1) 570-700 mm SVL; (2) >700 mm SVL. Estimated based on figure 4.
	-	-	2	-	23	7 SD		15	63	16	1976-79		
Bauman & Metter 1977 (sipedon)	-	-	-	-				15	63	55	Missouri	NS	
Beatson 1976 (sipedon)	-	-	-	-	18.8					14	Kansas 1972	stream	
Behler and King 1979	-	-	-	-	15-30			8	99		NS	NS	
Camin & Erlich 1958 (insularum)	-	-	-	-	20.8	8.2 SD		6	34	14	Ohio, Ontario CAN 1980-84	Lake Erie islands	
DeGraaf & Rudis 1983 (sipedon)	-	-	-	-	30			10	76		NS	NS	
Feaver 1977 (sipedon)	-	-	-	-	11.8			4	24	43	Michigan	pond, marshes	As cited in King 1986.
King 1986 (insularum)	-	-	-	-	22.9			9	50	39	Ohio, Ontario CAN 1980-84	Lake Erie islands	Litter size (because viviparous) increases with increasing female size.
Martof et al. 1980 (sipedon)	-	-	-	-				8	50		Carolinas, Virginia	NS	

Reference	Age	Sex	Cond	Seas	Mean	SD/SE	Units	Minimum	Maximum	N	Location	Habitat	Notes
Smith 1961 (sipedon)	-	-	-	-	18			8	51	6	Illinois	captive	Text notes average brood size is smaller than that noted for N.s. pleuralis.
Smith 1961 (pleuralis)	-	-	-	-	33			13	52	3	Illinois	NS	Author notes the average brood size is "much smaller" than this sample suggests.
Smith 1956 (sipedon)	-	-	-	-				10	76		Kansas	NS	Clutch size positively correlated with female body size.
LITTERS/YEAR													
Bauman & Metter 1977 (sipedon)	-	-	-	-	1		/yr				c Missouri 1973	fish hatchery	
Beatson 1976 (sipedon)	-	-	-	-	1		/yr				Kansas 1972	stream	
DAYS GESTATION													
Bauman & Metter 1977 (sipedon)	-	-	-	-	58		days				c Missouri	fish hatchery	The rate of development is temperature dependent and is likely to vary somewhat from year to year and by location.
AGE AT SEXUAL MATURITY													
Bauman & Metter 1977 (sipedon)	-	F	-	-	2-3		years				c Missouri 1973	fish hatchery	
	-	M	-	-	21		months						
Feaver 1977 (sipedon)	-	F	-	-	34		months				Michigan	pond, marshes	As cited in King 1986.
	-	M	-	-	23-24		months						
King 1986 (insularum)	-	F	-	-	3		years				Ohio, Ontario CAN 1980-84	Lake Erie islands	Growth of multiply recaptured individuals.
	-	M	-	-	2		years						
LENGTH AT SEXUAL MATURITY													
Aldridge 1982	-	F	-	-	600		mm SVL	570		31	e c Missouri 1976-79	streams	Length measured from snout to vent (SVL). Largest immature female found was 680 mm SVL.

Reference	Age	Sex	Cond	Seas	Mean	SD/SE	Units	Minimum	Maximum	N	Location	Habitat	Notes
Feaver 1977 (sipedon)	-	F	-	-			mm SVL	476	649		Michigan	pond, marshes	Length measured from snout to vent (SVL). As cited in King 1986.
	-	M	-	-			mm SVL	375	425				
King 1986 (insularum)	-	F	-	-	590		mm SVL				Ohio, Ontario	Lake Erie islands	Length measured from snout to vent
	-	M	-	-	430		mm SVL				CAN 1980-84		(SVL).

*** SEASONAL ACTIVITIES ***

Reference	Begin	Peak	End	Location	Habitat	Notes
MATING						
Bauman & Metter 1977 (sipedon)	mid May		mid Jun	c Missouri 1973	fish hatchery	
Behler & King 1979	Apr		Jun	NS	NS	
Feaver 1977 (sipedon)		May		Michigan	pond, marshes	As cited in King 1986.
King 1986 (insularum)	May 11		Jun 11	Ohio, Ontario CAN 1980-84	Lake Erie islands	Season for courtship behavior.
Smith 1956 (sipedon)		Apr-May		Kansas	NS	Spring mating season.
PARTURITION						
Aldridge 1982 (sipedon)		late Aug		e c Missouri 1976-79	streams	
Bauman & Metter 1977 (sipedon)	late Aug		earl Sep	c Missouri 1973	fish hatchery	
Behler & King 1979	Aug		Oct	NS	NS	
Feaver 1977 (sipedon)	mid Aug		mid Sep	Michigan	pond, marshes	As cited in King 1986.
King 1986 (insularum)	Aug 18		Sep 27	Ohio, Ontario CAN 1980-84	Lake Erie islands	
Martof et al. 1980 (sipedon)		late summer		Virginia, Carolinas	NS	

Reference	Age	Sex	Cond	Seas	Mean	SD/SE	Units	Minimum	Maximum	N	Location	Habitat	Notes
Smith 1961 (sipedon)			late	Aug				Sep			Illinois	NS	
Smith 1961 (pleuralis)			Aug					Sep			Illinois	NS	
Smith 1956 (sipedon)			Aug					Oct			Kansas	NS	
HIBERNATION													
Feaver 1977 (sipedon)			Nov					late Mar			Michigan	pond, marsh	Hibernation determined from earliest and latest capture dates. As cited in King 1986.
King 1986 (insularum)			mid	Oct				mid Apr			Ohio, Ontario CAN 1980-84	Lake Erie islands	Hibernation based on earliest and latest capture dates.

***** EASTERN NEWT *****

*** NORMALIZING AND CONTACT RATE FACTORS ***

Reference	Age	Sex	Cond	Seas	Mean	SD/SE	Units	Minimum	Maximum	N	Location	Habitat	Notes
BODY WEIGHT (AND LENGTH)													
Burton 1977 (viridescens)	E	B	-	-	1.45		g			36	New Hampshire 1970-72	beech/maple/birch forest	Length of eft. (E) was not specified.
Gill 1979	A	F	1	SU	2.51	0.04	SE g			121	Virginia 1975-76	mountain ponds	Post breeding newts in control years for the Lower Feedstone pond. Year: (1) 1975; (2) 1976. Sampled in July.
	A	F	2	SU	2.27	0.04	SE g			99			
	A	M	1	SU	2.82	0.04	SE g			124			
	A	M	2	SU	2.63	0.03	SE g			170			
Gillis & Breuer 1984	A	B	-	-	2.24	0.71	SD g (91 mm total)	1.12	3.52	20	New York	NS	Length measure is total length of eft (E).
	E	B	-	-	1.10	0.40	SD g (71 mm total)	0.42	1.82	36			
Gill 1979	A	M	1	SP	2.21	0.30	SD g			86	Virginia 1977	mountain ponds	Age of adults: (1) first year as adult; (2) second year as adult; and (3) third or fourth year as adult. Sampled on April 9.
	A	M	2	SP	2.27	0.39	SD g			62			
	A	M	3	SP	2.50	0.34	SD g			203			
	A	F	1	SP	2.43	0.32	SD g			60			
	A	F	2	SP	2.60	0.43	SD g			30			
	A	F	3	SP	2.70	0.42	SD g			52			
Gill 1979	A	F	1	SP	3.05	0.06	SE g			45	Virginia 1975	mountain ponds	Weights of (1) pre-breeding (March 27-April 3); and (2) post-breeding (July 22) adult newts in Upper Feedstone Pond.
	A	F	2	SU	2.49	0.06	SE g			48			
	A	M	1	SP	2.49	0.03	SE g			89			
	A	M	2	SU	2.76	0.03	SE g			138			
Morin 1986 (viridescens)	A	B	-	SP	2.91		g (44 mm SVL)				New Jersey 1984	ponds	Length measured was from snout to vent (SVL).
Pitkin 1983	A	B	-	SU	2.13	0.44	SD g (44 mm SVL)			27	Massachusetts 1980	shallow pond	Data from mid-July, mid-January, mid-March, and the end of November. Length measured was from snout to vent (SVL).
	A	B	-	WI	1.94	0.33	SD g (42 mm SVL)			20			
	A	B	-	SP	1.71	0.43	SD g (43 mm SVL)			21			
	A	B	-	FA	1.63	0.28	SD g (42 mm SVL)			21			
Stefanski et al. 1989	E	B	-	SU	1.23		g	0.63	2.17	27	New York 1986	NS	Age (E) = eft.
Taylor et al. 1988	L	B	-	SU	0.044	0.025	SD g (13 mm SVL)			22	S Carolina 1984	pond, wetlands	Age (E) = eft. Length of larvae (L) measured from snout to vent (SVL). Data are from June and early September.
	L	B	-	FA	0.54	0.17	SD g (22 mm SVL)			12			

Reference	Age	Sex	Cond	Seas	Mean	SD/SE	Units	Minimum	Maximum	N	Location	Habitat	Notes
BODY LENGTH													
Behler & King 1979	A	-	-	-	65-104		mm total				NS	NS	Total adult length.
Behler & King 1979	H	-	-	-	8		mm total				NS	NS	Total length of hatchling (H) larvae.
Behler & King 1979	E	-	-	-	35-86		mm total				NS	NS	Total length of eft (E).
Brophy 1980	L	B	-	SP	12.3		mm SVL				s Illinois 1976	shallow pond	Length of larvae (L) in May and September; total sample size was 68. Most transformed and left the pond by mid-September. Length measured from snout to vent (SVL).
	L	B	-	FA	19.2		mm SVL						
Harris 1989 (dorsalis)	H	B	-	-	4.8	0.04 SE	mm SVL			25	N Carolina 1988	lab	Age (L) = larvae, age (H) = hatchling, (P) = paedomorph (sexually mature larval form), (E) = eft. Length measured from snout to vent (SVL).
	L	B	-	-	13.0	0.41 SE	mm SVL			124			
	E	B	-	-	23.0	0.18 SE	mm SVL			58			
	A	M	-	-	30.7	0.77 SE	mm SVL			24			
	A	F	-	-	31.90	1.52 SE	mm SVL			8			
	P	M	-	-	33.0	0.44 SE	mm SVL			18			
	P	F	-	-	34.0	0.44 SE	mm SVL			31			
Harris et al. 1988 (dorsalis)	A	M	-	-	35		mm SVL	24	44		N Carolina 1983-84	shallow pond	Estimated from Figure 3. Length measured from snout to vent (SVL).
	A	F	-	-	35.0		mm SVL	20	42				
Harris et al. 1988 (dorsalis)	E	B	-	-	50.4	0.5 SE	mm total			73	N Carolina 1984	edge of shallow pond	Recently metamorphosed eft (E) with visible gill stumps. Total length measured.
Harris et al. 1988 (dorsalis)	L	B	1	-	10.0		mm total				N Carolina 1983-84	shallow pond	Age of larval (L) newts (May 1 = day 1): (1) 10 days; (2) 60 days; (3) 80 days; (4) late in larval period (approximate days 105-125) in 1983; and (5) late in larval period in 1984. Density of larvae in 1983 was much higher than the density in 1984. Total length measured.
	L	B	2	-	26.0		mm total						
	L	B	3	-	32.0		mm total						
	L	B	4	-	37.3	4.9 SE	mm total			156			
	L	B	5	-	47.8	6.1 SE	mm total			25			
Healy 1973 (viridescens)	J	B	1	SP	26.1	0.35 SE	mm SVL	20	32	50	Massachusetts 1961-65	coastal pond	Aquatic juveniles (J): have metamorphosed from larvae but are not sexually mature. Age: (1) 12 months Apr 1962; (2) 12 months Apr 1965; (3) 14 months June 1962; (4) 14 months June 1963; (5) 15 to 16 months July-Aug 1964; (6) 15 to 16 months July-Aug 1961. Length measured from snout to vent (SVL).
	J	B	2	SP	26.5	0.17 SE	mm SVL	22	31	109			
	J	B	3	SU	31.0	0.32 SE	mm SVL	26	36	56			
	J	B	4	SU	30.4	0.45 SE	mm SVL	26	33	20			
	J	B	5	SU	33.6	0.20 SE	mm SVL	27	38	116			
	J	B	6	SU	33.20	0.41 SE	mm SVL	29	36	25			

Reference	Age	Sex	Cond	Seas	Mean	SD/SE	Units	Minimum	Maximum	N	Location	Habitat	Notes
Healy 1973 (viridescens)	E	B	1	SP	20.5		mm SVL				Massachusetts 1968-70	oak/pine woodland	Age (from time of hatching) of terrestrial efts (E): (1) one year; (2) 2 years; (3) 3 years; and (4) 4 years. Estimated from Figure 3. Length measured from snout to vent (SVL).
	E	B	2	SP	25.0		mm SVL						
	E	B	3	SP	31.0		mm SVL						
	E	B	4	SP	33.0		mm SVL						
	E	B	4	FA	37.5		mm SVL						
Hurlbert 1970	E	B	-	-			mm total	28	47		s c New York 1963-65	ponds, woods	Total length of migrating newly metamorphosed efts (E).
MacNamara 1977	A	B	-	SU	38.9		mm SVL	33	48	79	New York 1973	surface of leaf litter in forest	Adult migrants (aquatic adults using terrestrial habitats) and efts (E) caught in July and August. Length measured from snout to vent (SVL).
	E	B	-	SU	32.7		mm SVL	18	41	92			
Smith 1961	E	-	-	-	39-81		mm total				Illinois	NS	Total length of eft (E).
GROWTH RATE													
Harris 1987 (dorsalis)	E	-	1	SU	0.00635		g/day			2	N Carolina	outdoor labs	Growth rate of larvae becoming (E) efts, (A) mature adults, and (P) paedomorphs at two different densities of larvae; initial density: (1) 220 larvae/ha; (2) 55,000 larvae/ha.
	E	-	2	SU	0.00310		g/day			180			
	A	-	1	SU	0.00685		g/day			11			
	A	-	2	SU	0.00421		g/day			11			
	P	-	1	SU	0.00676		g/day			49			
	P	-	2	SU	0.00536		g/day			21			
Healy 1973 (viridescens)	E	B	-	-	6.6		mm SVL/yr			36	Massachusetts 1968-70	forest, pond	Annual growth of terrestrial efts (E) and aquatic juveniles (J). Eft stage lasts about 4 years; aquatic juveniles become sexually mature after 2 years (two-year stage).
	J	B	-	-	12.9		mm SVL/yr						
METABOLIC RATE (OXYGEN)													
Stefanski et al. 1989	E	-	R	-	1.47		102/kg-day			13	New York 1986	lab	Efts (E) at 15 C: (R) Resting; (E) exercising, i.e., forced activity. Mean weight of efts was 1.23 g.
	E	-	E	-	4.27		102/kg-day			12			

*** DIET ***

Reference	Age	Sex	Food type	Spring	Summer	Fall	Winter	N	Location	Habitat - Measure	Notes
Brophy 1980	L	B	Cypridae (Ostracoda)		61.3			68	s Illinois 1976	shallow pond	Larval (L) diet: items comprising <0.5 % not listed here. Plant matter found in guts was though to have been incidentally ingested and was not included in % dry weight determinations.
			Physa sp. (Gastropoda)		22.4					-	
			Chironomidae (Diptera)		1.7					% dry weight; gut contents	
			Aphididae (Homoptera)		0.9					-	
			Chaoborus sp. (Diptera)		0.8					12-21 mm SVL	
			Macrocyclus albidus (Copepoda)		0.8						
Burton 1977 (viridescens)	A	B	Ephemeroptera		7.5	7.5			New Hampshire 1970-71	small oligotrophic lake	Diet of aquatic adults. Wet weight estimated from linear measurements, calculated volume and specific gravity of 1.05. Summer data were collected on two days in July 1970; fall data were collected on October 3, 1971.
			Odonata		31.9	1.9				-	
			Lepidoptera		13.7	0.9				% wet weight;	
			Diptera		5.8	0.3				stomach and gut	
			other insects		9.9	0.6				contents	
			Cladocerans		5.1	84.1					
			Amphipoda		5.6	3.1					
			Pelyceopoda		6.2	1.5					
			N. viridiscens larva		11.4	0					
			other		3.2	0.1					
			(sample size)		(40)	(35)					
Burton 1976	E	B	mites		3.4			35	New Hampshire 1970-72	beech/maple/birch forest	Diet of terrestrial eft (E). Wet weight estimated from linear measurements, calculated volume and specific gravity of 1.05.
			Collembola		9.1					-	
			Homoptera		4.0					% wet weight;	
			Coleoptera		4.6					stomach and gut	
			Diptera		10.5					contents	
			Lepidoptera larva		2.3						
			Araneida		2.3						
			Gastropoda		59.7						
			Thysanoptera		0.6						
			Hemiptera		0.8						
			unidentified insects		1.4						
Burton 1977 (viridescens) (continued)	L	B	Zygoptera (Odonata)		0.8			20	New Hampshire 1970	small oligotrophic lake	Diet of larvae (L). Wet weight estimated from linear measurements, calculated volume, and specific gravity of 1.05. Collected in August.
			Chironomidae (Diptera)		16.2					-	
			Cladocera		12.7					% wet weight;	
			Ostracoda		5.3					stomach and gut	
			Hyallela azteca (Amphipoda)		55.1					contents	
			Sphaerium sp.		9.4						
			(Pelyceopoda)								
(continued)											

Reference	Age	Sex	Food type	Spring	Summer	Fall	Winter	N	Location	Habitat - Measure	Notes
Burton 1977 (viridescens) (continued)			Planorbidae (Gastropoda) Rhizopoda (Protozoa)		0.5 0.01						
MacNamara 1977	A	B	Basommatophora Stylommatophora Acari Collembola Thysanoptera Homoptera Coleoptera (adult and larvae) Lepidoptera larvae Diptera adult Diptera larvae Hymenoptera adult		1.60 25.2 1.8 5.6 2.5 3.5 2.3 19.7 9.0 18.80 4.2			79	New York 1973	leaf litter surface in forest - % dry weight; stomach contents	Adult migrants (aquatic adults using terrestrial habitat). Mean snout to vent length (SVL) was 38.9 mm SVL (range 33 to 48 mm SVL). Items comprising <1.5 % not listed here.
MacNamara 1977	E	B	Basommatophora Stylommatophora Acari Collembola Thysanoptera Homoptera Coleoptera adult Coleoptera larvae Lepidoptera larvae Diptera adult Diptera larvae Hymenoptera adult		5.5 18.3 13.8 10.4 3.4 4.7 2.3 3.5 7.9 9.7 10.6 5.8			92	New York 1973	leaf litter surface in forest - % dry weight; stomach contents	Eft (E) diet. Mean snout to vent length (SVL) of efts was 32.7 mm SVL (range 18-41 mm SVL). Items comprising <1.5 % not listed here.
Ries & Bellis 1966	A	B	Sphaeriidae (Pelecypoda) Enchytraeidae (Oligochaeta) Crustacea Pionidae (Arachnoidae) Ephemeroidea (Ephemeroptera) Odonata Hemiptera Trichoptera Coleoptera Culicidae (Diptera) Simuliidae (Diptera) Tendipedidae (Diptera) Ceratopogonidae (Diptera) (sample size)	4 1 2 2 25 2 29 1 12 1 14 6	4 - 5 - 1 3 6 6 21 2 <1 47 4				c Pennsylvania 1963	shallow pond - % of total number of prey items; stomach contents	Spring newts collected in April and May; summer collected in June. N = number of prey items; total number of newts was 179 in spring and 89 in summer. Items comprising <1 % in both seasons not listed here.

Reference	Age	Sex	Food type	Spring	Summer	Fall	Winter	N	Location	Habitat - Measure	Notes
Taylor et al. 1988	L	B	cladocerans		73	42			S Carolina	pond, wetland	Larval (L) diet estimated from bar
			copepods		<1	0			1984	-	graphs of proportion of principal
			dipterans		6	39				% of number of	prey in the diet.
			other crustaceans		20	19				items; gut	
			other		<1	<1				contents	

*** POPULATION DYNAMICS ***

Reference	Age	Sex	Cond	Seas	Mean	SD/SE	Units	Minimum	Maximum	N	Location	Habitat	Notes
HOME RANGE SIZE													
Bellis 1968 (viridescens)	A	-	-	SU	6.86		m				Pennsylvania 1962	small pond	Mean distance between capture and recapture sites.
Healy 1975 (viridescens)	E	B	1	-	00.0087		ha	0.00284	0.01528	10	Massachusetts	oak/pine forest	Terrestrial home ranges of eft (E)
	E	B	2	-	0.0267		ha	0.00954	0.04661	10	1969-71		estimated using: (1) Minimum polygon method; (2) radius method. Average captures = 7.3/eft. Average snout to vent length (SVL) = 31 mm.

POPULATION DENSITY

Bellis 1968 (viridescens)	A	M	-	SU	16,300		N/ha				Pennsylvania 1962	small pond	Estimate based on the number of newts observed between late June and late August.
	A	F	-	SU	4,700		N/ha						
Burton 1977 (viridescens)	A	B	1	SU	130-173		N/ha			2	New Hampshire	small oligotrophic	Density of adult newts in (1)
	A	B	2	SU	50-2,600		N/ha			2	1971-72	lake	entire 15 ha lake and (2) in 1 ha portion of utilized habitat. Newt distribution was highly correlated with the distribution of rooted macrophytes in water <2 m deep so that most newts were found in scattered portions of the lake which totalled only about 1 ha. Population size determined by SCUBA quadrat technique (after Bennett 1970). N = number of yearly estimates.
Harris et al. 1988 (dorsalis)	L	B	1	-	0-5,000		N/ha			120	N Carolina	shallow pond	Larval (L) density estimated from Figure 1. Month of samples: (1)
	L	B	2	SP	65,000	15,000 SE	N/ha			20	1984		December - mid-May; (2) late May;
	L	B	3	SU	25,000	5,000 SE	N/ha			20			(3) July; and (4) early September.
	L	B	4	FA	10,000	3,000 SE	N/ha			20			N = number of samples.

Reference	Age	Sex	Cond	Seas	Mean	SD/SE	Units	Minimum	Maximum	N	Location	Habitat	Notes
Harris et al. 1988 (dorsalis)	L	B	1	-	0		N/ha			86	N Carolina	shallow pond	Larval (L) density estimated from Figure 1. Month of sample: (1) February - mid-May; (2) late May; (3) July; (4) early September; and (5) late October. N = number of samples.
	L	B	2	SP	65,000	20,000 SE	N/ha			20	1983		
	L	B	3	SU	230,000	30,000 SE	N/ha			20			
	L	B	4	FA	140,000	20,000 SE	N/ha			20			
	L	B	5	FA	10,000	3,000 SE	N/ha			20			
Harris et al. 1988 (dorsalis)	A	B	1	WI	14,000	4,000 SE	N/ha			20	N Carolina	shallow pond	Estimated from Figure 1. Month of sample: (1) January; (2) late March; (3) early July, early August, and September; and (4) November. N = number of samples.
	A	B	2	SP	9,000	3,000 SE	N/ha			20	1984		
	A	B	3	SU	2,000	500 SE	N/ha			60			
	A	B	4	FA	7,000	2,000 SE	N/ha			20			
Harris et al. 1988 (dorsalis)	A	B	1	WI	50,000	9,000 SE	N/ha			10	N Carolina	shallow pond	Estimated from Figure 1. Month of sample: (1) February; (2) March; (3) May; (4) July - August; and (5) October. N = number of samples.
	A	B	2	SP	22,000	5,000 SE	N/ha			16	1983		
	A	B	3	SP	5,000	2,000 SE	N/ha			20			
	A	B	4	SU	3,000	1,000 SE	N/ha			60			
	A	B	5	FA	8,000	3,000 SE	N/ha			20			
Healy 1975 (viridescens)	E	B	-	SP	300		N/ha			478	Massachusetts 1969	oak/pine forest	Eft (E) density.
Shure et al. 1989 (viridescens)	E	B	-	SU	34		N/ha	20	50	6	N Carolina 1987	mixed deciduous forest	Average of eft (E) density estimates made from single searches of area 1400-4500 square meters in size.
Taylor et al. 1988	L	B	-	SP	21,000		N/ha	0	350,000	18	S Carolina 1984	pond, wetland	Larval (L) density. Data collected 5/20/87; in April and March, none were present.
CLUTCH SIZE													
Behler & King 1979	-	-	-	-	200-400		eggs				NS	NS	
Gill 1978a	-	-	-	-	2.63		N survive	0	37.67	14	Virginia 1974-76	mountain ponds	Juveniles (efts) produced per breeding adult female. Average of five ponds over three years; regional variance = 8.30.
DAYS INCUBATION													
Behler & King 1979 (viridescens)	-	-	-	-	21-56		days				NS	NS	
Gage 1891	-	-	-	-	20-35		days				New York	ponds	As cited in Hurlbert 1970.

Reference	Age	Sex	Cond	Seas	Mean	SD/SE	Units	Minimum	Maximum	N	Location	Habitat	Notes
Logier 1952 (viridescens)	-	-	-	-	21-35		days				NS	NS	As cited in DeGraaf and Rudis 1983.
Smith 1961	-	-	-	-	14-21		days				Illinois	NS	
Smith 1956 (viridescens)	-	-	-	-	20-35		days				e Kansas	NS	This information is likely to be based on Bishop 1941.
TIME TO METAMORPHOSIS													
Gibbons & Semlitsch 1991	E	-	-	-	1-3		years				S Carolina	ponds	Estimated duration of the eft (E) stage.
Healy 1974 (viridescens)	L	-	-	-	6		months				Massachusetts 1960-71	inland ponds	Larval (L) period (from hatching until metamorphosis to eft).
Hurlbert 1970	L	-	-	-	2		months				New York 1963-65	shallow ponds	Larval (L) period (from hatching until metamorphosis to eft).
Smith 1961 (louisianensis)	L	-	-	-	2-3		months				Illinois	NS	Larval (L) period until metamorphosis to eft.
Smith 1956 (viridescens)	L	-	-	-	3-4		months				e Kansas	NS	Larval (L) period until metamorphosis to eft; this information is likely to be based on Bishop 1941.
Smith 1961 (louisianensis)	E	-	-	-	2-3		years				Illinois	NS	Eft (E) period until metamorphosis to sexually mature adult.
Smith 1956 (viridescens)	E	-	-	-	2.5-3.5		years				e Kansas	NS	Eft (E) period after transformation to sexually mature adult. This information is likely to be based on Bishop 1941.
AGE AT SEXUAL MATURITY													
Healy 1974 (viridescens)	E	B	-	-	5-6		years	4	8		Massachusetts 1968-71	inland ponds, forests	Three to seven years in the eft stage.
Healy 1974 (viridescens)	-	B	1	-	2		years				Massachusetts 1960-65	coastal ponds	Age at sexual maturity in (1) Swampscott population (1961-65) and (2) Cape Cod population (1960-64). No eft stage.
	-	B	2	-	2		years						

Reference	Age	Sex	Cond	Seas	Mean	SD/SE	Units	Minimum	Maximum	N	Location	Habitat	Notes
LENGTH AT SEXUAL MATURITY													
Harris et al. 1988 (dorsalis)	E	B	1	-	28.4	1.3	SE mm SVL			11	N Carolina 1982-84	pine/oak forest	Efts (E) that were transforming into breeding adults; (1) estimate of size at first reproduction. Efts in this stage were usually found in fall or winter.
MORTALITY													
Gill 1978a	A	M	-	-	45.8		%/yr				Virginia	mountain ponds	Estimated from number of marked individuals returning to ponds in the spring following dormancy period.
	A	F	-	-	54.1		%/yr				1974-75		
Gill 1978a	A	M	-	-	53.1		%/yr				Virginia	mountain ponds	Estimated from number of marked individuals returning to ponds in the spring following dormancy period.
	A	F	-	-	59.5		%/yr				1975-76		
LONGEVITY													
Gill 1978a	A	M	-	-	1.9		breeding seasons				Virginia	mountain ponds	Assuming stationary population size. Estimated from survivorship. Estimate is qualitative due to demonstrable variation in survival rates between years.
	A	F	-	-	1.3		breeding seasons				1974-76		
Gill 1978b	A	M	-	-	2.1		breeding seasons				Virginia	mountain ponds	Estimation of mean not specified.
	A	F	-	-	1.7		breeding seasons				1974-76		

*** SEASONAL ACTIVITIES ***

Reference	Begin	Peak	End	Location	Habitat	Notes
MATING/LAYING						
Behler & King 1979	lat winter	earl spring		NS	NS	
Gibbons & Semlitsch 1991	Feb - March		Apr - May	S Carolina	ponds	
Gill 1978a	Mar		Jun	Virginia 1974-76	mountain ponds	Observations of actively courting adults; egg-laying inferred to have occurred throughout this period.

Reference	Begin	Peak	End	Location	Habitat	Notes
Harris et al. 1988	winter		spring	N Carolina 1982-84	shallow pond	Courtship season.
Harris et al. 1988	Apr		Jun	N Carolina 1982-84	shallow pond	Egg laying season.
Massey 1990	lat Mar		lat Jun	Virginia 1984-85	woodland pond	
Morin et al. 1983	Apr			N Carolina 1981	tanks	Beginning of oviposition.
Taylor et al. 1988		winter		S Carolina 1984	pond, wetlands	Egg laying season.
HATCHING						
Behler & King 1979		spring		NS	NS	
Gill 1978a	Jun			Virginia 1974-76	mountain ponds	
Harris et al. 1988	lat Apr			N Carolina 1982-84	shallow pond	
Morin et al. 1983 (dorsalis)	May			N Carolina 1981	tanks	
METAMORPHOSIS TO EFT						
Behler & King 1979	lat summer	earl fall		NS	NS	
Brophy 1980		mid Sep		s Illinois 1976	shallow pond	
Gibbons & Semlitsch 1991	Jun		Sep	S Carolina	ponds	
Gill 1978a	mid Aug		lat Nov	Virginia 1974-76	mountain ponds	
Hurlbert 1970	mid Jul	Aug - Sep	earl Nov	New York 1963-65	ponds	The metamorphosis and migration of efts showed two more or less distinct "waves".
Taylor et al. 1988	Jul - Aug	Sep		S Carolina 1984	pond, wetlands	

Reference	Begin	Peak	End	Location	Habitat	Notes
FALL MIGRATION						
Gill 1978a	Aug - Sep		Nov	Virginia 1974-76	mountain ponds	Hibernation by adults begins with mass migration to hibernacula (terrestrial).
Hurlbert 1969	lat Aug	Sep - Oct	mid Nov	s c New York 1963-65	ponds, woods	One of two periods of breeding migrations of eft's; coming from terrestrial habitats to aquatic.
Massey 1990	Aug			Virginia 1984-85	mountain ponds	Migration from ponds to terrestrial hibernacula.
Taylor et al. 1988		lat fall		S Carolina 1984	pond, wetlands	Return to the pond prior to breeding (pond dried in September).
SPRING MIGRATION						
Gill 1978a	Mar			Virginia 1974-76	mountain ponds	Arrival of adults at breeding ponds.
Hurlbert 1969	Mar	Apr - earl May	lat May	s c New York 1963-65	ponds, woods	One of two periods of breeding migrations of eft's; coming from terrestrial habitats to aquatic.
Massey 1990	lat Mar		lat Apr	Virginia 1984-85	mountain ponds	Arrival of adults at breeding ponds.

